

REMARKS

Responsive to the outstanding Office Action, applicant has carefully studied the Examiner's rejections. Claim 28 has been newly presented herein. Favorable reconsideration of the application in light of the following detailed arguments is respectfully requested.

REJECTION OF CLAIMS UNDER 35 USC §103

In the outstanding Office Action, the Examiner made the following rejections:

Claims 13-15, 17-19 and 21-23 were again rejected under 35 USC §103 as being unpatentable over US 470,060 (Lille) in view of US 3,849,232 (Kessler) and US 5,054,547 (Shipley).

Claims 16 and 24 were again rejected under 35 USC 103 as being unpatentable over Lille in view of Kessler and Shipley and further in view of US 5,217,065 (Green).

Claims 13 and 20 were again rejected under 35 USC 103 as being unpatentable over Lillie in view of Kessler, Van Hesselt (WO 02/070120) and Shipley.

Claims 25-26 were rejected under 35 USC 103 as being unpatentable over US 5,004,043 (Mucic) in view of US 4,133485 (Bouvin), WO 03/053563 (Manteufel) and US 5,217,065 (Green).

Claim 27 was rejected under 35 USC 103 as being unpatentable over Lillie in view of Kessler, Van Hesselt, Shipley, Bouvin, Manteufel and Green.

The present invention, as defined in independent claim 13, defines a liquid distributor for two liquid phases to be distributed uniformly into a plurality of tubes of an upright tube-bundle reactor for carrying out chemical reactions, wherein the tubes are

retained at the top and bottom by tubesheets and closed against the outside of the tube, and wherein a distribution chamber is arranged above the upper tubesheet, which chamber contains feed pipes for two different liquids and at least one gas phase. The distributor comprises a first liquid distribution system is arranged above a tubesheet or on it, which first system is connected to at least one outer feed device, and contains a weir, installed outside the tubed area, with openings at the bottom and a plurality of inlet sleeves. One inlet sleeve is assigned at the top to each of the tubes in a tube bundle, the inlet sleeves are of tubular design and are vertically aligned, and said sleeves have at least one lateral and one further opening located above the tubesheet and are open at the bottom facing each assigned tube in the tube bundle. A second liquid distribution system is arranged above the first liquid distribution system, which system is connected to at least one other outer feed device and contains one upper and one lower distribution tray. The lower distribution tray contains a plurality of openings which are arranged flush above the inlet sleeves of the first liquid distribution system, and exhibits at least one device for setting a uniform liquid level above the openings. The upper distribution tray is connected to the feed device for liquid, and contains a plurality of overflow weirs or plate holes from which the liquid is able to discharge into the lower distribution tray, and wherein each of the overflow weirs is assigned to a plurality of openings in the lower distribution tray.

The Examiner notes on page 20 that arguments cannot take the place of evidence in the record. It is respectfully submitted, however, that one skilled in the relevant art would recognize that if a mixture of two immiscible fluids were conveyed through a horizontally arranged trough, the liquids will quickly separate with the heavier

liquid flowing along the bottom of the trough and the lighter liquid flowing above the heavier liquid. If that trough is designed so that there are small holes in the bottom of the trough, only the heavier liquid, occupying the lower portion of the trough will pass through. If the trough continues along this horizontal path till all of the heavier fluid is drained, the lighter fluid will then begin to drain from the trough. Again, at this point, only the lighter fluid will drain as the heavier fluid will have been removed. Thus, during the beginning portion of the trough only the heavier fluid will be removed, and during the later portion of the trough, only the lighter portion will be removed. And in each case the material removed from the trough will be 100% of one of the two immiscible fluids (heavier first, lighter second). It is not possible in such an arrangement that relative proportions of each of the fluids can be drained through each of the holes along the trough path in a predetermined and constant manner. This would be recognizable from a basic understanding of immiscible fluids. The immiscible fluids will have separated and the heavier will block the lighter from draining along the first portion of the trough. The requirement of feeding a stoichiometric mixture, as claimed herein, requires that a predetermined percentage of the heavier and lighter fluids needs to be guaranteed over all of the tubes.

In Lillie, as described, only the heavier phase can flow into the tubes. To the contrary, In Kessler, as described, only the lighter phase can flow into the tubes. There is nothing in either of these references, nor in the combination thereof, to define a certain percentage of both liquids to come into each tube. One skilled in the art, in looking at these references would only see the possibility of feeding 100% of the heavier phase fluid or 100% of the lighter phase fluid into the tubes.

Further, applicants respectfully disagree with the Examiner's contentions regarding the Kessler document. The Kessler distributor, as defined in that patent, is not capable of distributing a feed with two (immiscible) liquid phases uniformly into a plurality of tubes of an upright-tube bundle for carrying out chemical reactions. In Kessler, the trough (6) would separate the two immiscible liquids, thus preventing the feeding of a stoichiometric mixture to the individual reactor tubes, as is required in claim 13. Similarly in the Lillie reference, the plate  $p^2$  would cause this same effect and would similarly prevent the feeding of a stoichiometric mixture to the individual reactor tubes. Therefore, as this same defect is found in both of the references, there is no combination of these references which would yield the invention as claimed in claim 13.

The Shipley reference was cited by the Examiner to show: a first liquid distribution system which contains a weir, installed outside the tubed area, with openings at the bottom and a plurality of inlet sleeves (26), wherein one inlet sleeve is assigned at the top to each of the tubes (24) in the tube bundle, the inlet sleeves are of tubular design and are vertically aligned, and the said sleeves have at least one lateral and one further opening (36) located above the tube sheet (16) and are open at the bottom facing each assigned tube in the tube bundle (see column 3, line 41 through column 4, line 64 and figures 1-6).

There is nothing in this reference to overcome the deficiency in the Kessler and Lillie references as noted above.

Further, it should be noted that the distributors disclosed by Kessler would face distribution problems with higher gas loads which could bend the small descending liquid stream to the individual tubes. This problem of the prior art is avoided in the present invention by the claimed inlet sleeve (1) which conveys the liquid from the perforated fine distributor (15) to the individual tube (10). It is respectfully submitted that no combination of the applied reference show this feature of the claimed invention.

In view of the above, it is respectfully submitted that no combination of the applied references disclose the invention as claimed in claim 13. Reconsideration and withdrawal of this rejection is respectfully requested.

With regard to the rejection of Claims 16 and 24 as being unpatentable over Lille in view of Kessler and Shipley and further in view of Green, claims 16 and 24 are dependent upon an allowable base claim, as shown above, and are believe to be allowable based, at least, upon that dependence.

With regard to the rejection of claims 13 and 20 as being unpatentable over Lillie in view of Kessler, Van Hasselt (WO 02/070120) and Shipley, the Examiner included the Van Hasselt reference to disclose the overflow weirs of the upper distribution tray of the second liquid distribution system exhibiting a serrated shape on its upper edge or lower edge.

It is respectfully submitted that nothing in the Van Hasselt reference changes the analysis of the present invention as discussed above. Therefore, for the reasons stated above, it is requested that this rejection also be reconsidered and withdrawn.

It is additionally noted that dependent claim 17 discloses the upper liquid distribution system rests on the inlet sleeves of the lower liquid distribution system. It is respectfully submitted that this feature is not disclosed in any of the applied references, and therefore that this claim further defines over the art of record.

With regard to the rejection of claims 25-26 as being unpatentable over US 5,004,043 (Mucic) in view of US 4,133485 (Bouvin), WO 03/053563 (Manteufel) and US 5,217,065 (Green), it again noted that claim 25 includes structural elements found in claim 13. In view of the above arguments, it is respectfully submitted that this structure is not shown in any combination of the applied references, and that this claim is therefore allowable over the applied art of record.

Further, claim 25 defines a method for two liquid phases to be uniformly distributed into a plurality of tubes of an upright tube-bundle reactor, the liquids being two liquids which cannot be mixed and which, because of their non-miscibility, cannot be pre-mixed, wherein the liquids are introduced separately into the individual tubes of the tube bundle.

The present invention allows two (immiscible) liquid phases uniformly into a plurality of tubes of an upright-tube bundle for carrying out chemical reactions. The claimed invention provides for the feeding of a stoichiometric mixture to the individual reactor tubes. There is no combination of these references which would yield the invention as claimed in claim 25.

As noted above, the prior art distributors would face distribution problems with higher gas loads which could bend the small descending liquid stream to the individual tubes. The configuration of the present invention by the inlet sleeve (1) which conveys the liquid from the perforated fine distributor (15) to the individual tube (10) avoids this problem. It is respectfully submitted that no combination of the applied reference show this feature of the claimed invention.

With regard to the rejection of Claim 27 under 35 USC 103 as being unpatentable over Lillie in view of Kessler, Van Hesselt, Shipley, Bouvin, Manteufel and Green, it is respectfully submitted that this method claim contains all of the structural limitations of the primary structure claim, and the method of the above method claim. It is first argued, as discussed above, that no reasonable combination of the applied references yields the structure of the invention as claimed herein. Further, the Examiner has in essence stated in the present action that it would be obvious to combine elements of 7 different references to yield the present invention. It is respectfully submitted that such a combination would not be obvious to one skilled in the art. Seven diverse references, taking pieces from each of them would not be foreseeable. It is only through the disclosure of the present invention, using improper hindsight analysis, that such would be foreseeable. Therefore, it is submitted that this further distinguishes the applied reference from the art of record.

In light of the above, it is respectfully submitted that independent claims 13, 25 and 27 are allowable over the applied art of record. The dependent claims are allowable based, at least, on their dependence from allowable base claims. Action towards that end is respectfully requested.

SUMMARY

It is believe that the above amendments place the application in condition for allowance. Should the Examiner wish to modify the application in any way, applicant's attorney suggests a telephone interview in order to expedite the prosecution of the application.

Respectfully submitted,

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